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# Chapter 1



## Toxics Release Inventory Data by Industry

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### Introduction

In May 1998, the U.S. Environmental Protection Agency published the *1996 Toxics Release Inventory Public Data Release*, summarizing the 1996 Toxics Release Inventory (TRI) data nationwide and presenting more detailed analyses by state and by chemical. The document also compared the 1996 data to earlier reporting years. It supplied background information on TRI reporting, described past and future changes in the TRI program, and provided information that TRI users need to consider in examining and analyzing these data. Expanding on previous data release reports, the release in May of the *1996 TRI Public Data Release* provided a more comprehensive view of industry data and examined more closely TRI reporting in five priority industrial sectors and federal facilities.

This volume presents the data for the remaining 15 industrial sectors, identified by Standard Industrial Classification (SIC) codes, that are presently required to report to TRI. Similar to the May release, these chapters set the TRI data in context of economic, regulatory, and technological developments that influence industry-wide releases

and other waste management. They also analyze reporting by industrial activities at the four-digit SIC code level.

Industry sectors covered in the two publications appear in Box 1-1.

#### Box 1-1. Industry Sectors in the 1996 TRI Public Data Release

##### First Release, Spring 1998

- 26 Pulp and Paper
- 28 Chemical Manufacturing
- 29 Petroleum Refining
- 33 Primary Metals
- 36 Electrical Equipment

##### Second Release, Fall 1998

- 20 Food and Beverage Processing
- 21 Tobacco Products
- 22 Textile Mill Products
- 23 Apparel and Fabricated Textiles
- 24 Lumber and Wood Products
- 25 Furniture
- 27 Printing and Publishing
- 30 Rubber and Plastics Products
- 31 Leather and Leather Products
- 32 Stone, Clay, Glass, and Concrete
- 34 Fabricated Metals
- 35 Industrial Machinery
- 37 Transportation Equipment
- 38 Instruments and Photographic Equipment
- 39 Miscellaneous Manufacturing



## Context for Presentation of Industry Data

The *1996 TRI Public Data Release* published in May 1998 provides an overview of the information collected through TRI. It describes the benefits and limitations of the data, explains key terms, and discusses factors such as toxicity and exposure that should be considered when reviewing TRI data. This section presents selected summary information from the May 1998 document to facilitate the understanding of the industry-specific analyses in the chapters that follow. This includes characteristics of TRI data, key concepts, and supplemental economic information that are specifically referred to throughout this volume. Readers are encouraged to consult the earlier publication for additional information.

### Who Reports and What Must Be Reported?

Manufacturing facilities with the equivalent of 10 or more full-time employees that meet the established thresholds must report their releases, transfers, and waste management quantities to TRI. Thresholds for manufacturing and processing are currently 25,000 pounds for each listed chemical, while the threshold for “otherwise using” is 10,000 pounds per chemical. Manufacturing facilities include those in SIC codes 20 to 39 (listed in Box 1-1). Box 1-2 summarizes reporting criteria for facilities that must report to TRI. In July 1999 (for reporting year 1998), another seven industrial sectors will report to TRI for the first time; these appear in Box 1-3.

#### Box 1-2. Who Reported Toxic Chemical Release Inventory Reports for the 1996 Reporting Year?

##### Who Reported Toxic Chemical Release Inventory Reports for the 1996 Reporting Year?

A facility must report to TRI if it:

- Conducts manufacturing operations within Standard Industrial Classification (SIC) codes 20 through 39 (or is a federal facility in any SIC code),
- Has 10 or more full-time equivalent employees, and
- Manufactures or processes more than 25,000 pounds or otherwise uses more than 10,000 pounds of any listed chemical during the calendar year.

#### Box 1-3. Who Will Report to TRI Starting in the 1998 Reporting Year?

##### Who Will Report to TRI Starting in the 1998 Reporting Year?

- Metal mining (SIC code 10 except for SIC codes 1011, 1081, and 1094)
- Coal mining (SIC code 12 except for extraction activities)
- Electrical utilities that combust coal and/or oil (SIC codes 4931 and 4939)
- Resource Conservation and Recovery Act (RCRA) Subtitle C hazardous waste treatment and disposal facilities (SIC code 4953)
- Chemicals and allied products wholesale distributors (SIC code 5169)
- Petroleum bulk plants and terminals (SIC code 5171)
- Solvent recovery services (SIC code 7389)



Box 1-4 summarizes the kinds of information facilities must report. Since its inception under the Emergency Planning and Community Right-to-Know Act of 1986 (EPCRA), TRI has collected data on the amounts of chemicals that facilities release to the environment on-site and transfer off-site to other locations for waste management. Passage of the federal Pollution Prevention Act in 1990 expanded the information that TRI collects. The additional data on waste management include quantities recycled, burned for energy recovery, treated, and released on-site or off-site.

**Box 1-4. What Must Be Reported to TRI?****What Must Be Reported?**

Information reported by facilities includes:

- Basic information identifying the facility;
- Name and telephone number of a contact person;
- Environmental permits held;
- Amounts of each listed chemical released to the environment at the facility;
- Amounts of each chemical shipped from the facility to other locations for recycling, energy recovery, treatment, or disposal;
- Amounts of each chemical recycled, burned for energy recovery, or treated at the facility;
- Maximum amount of chemical present on-site at the facility during the year;
- Types of activities conducted at the facility involving the toxic chemical; and
- Source reduction activities.

**SIC Codes and TRI**

Standard Industrial Classification (SIC) codes are used throughout the federal government to classify economic activity by industry. Industry analyses in TRI rely on the SIC codes that facilities report on their TRI submissions to identify their business operations. Many facilities conduct manufacturing activity in more than one SIC code. Box 1-5

explains how SIC codes are used in preparing industry analyses in this book and how data on TRI forms with more than one SIC code are treated.

**Form A Certification Statements**

Facilities whose total annual reportable amount of a listed toxic chemical does not exceed 500 pounds can apply a higher activity threshold in determining their reporting obligations. The total annual reportable amount is defined as the sum of the waste management categories that would be reported to TRI: quantities released (including disposal), recovered as a result of on-site recycling operations, combusted on-site for energy recovery, and treated at the facility, plus amounts transferred off-site for recycling, energy recovery, treatment, and disposal. These amounts correspond to total production-related waste in this report.

If the facility does not exceed the 500-pound annual reportable amount (total production-related waste) and does not manufacture, process, or otherwise use more than 1 million pounds of the listed chemical, the facility can submit a certification statement (Form A) instead of the complete TRI reporting form (Form R). Form A certifies that the facility met the conditions outlined above for the listed chemical, but does not require reporting of any amounts of the toxic chemical released or otherwise managed as waste.

**TRI Releases and Waste Management**

Figure 1-1 illustrates on-site and off-site releases, on-site waste management activities, and transfers off-site for further waste management, as reportable to TRI. Box 1-6 describes reportable releases that may occur on-site at the facility or as a result of transferring chemicals off-site for disposal, and identifies types of activities that may contribute releases to various media. Box 1-7 lists on-site waste management activities that are reportable to TRI. Box 1-8 describes transfers off-site for further waste management.



**Box 1-5. An Explanation of SIC Codes and TRI**

**An Explanation of SIC Codes and TRI**

On TRI Form Rs and certification statements, Form As, facilities report the four-digit Standard Industrial Classification (SIC) codes that define their operations. A facility might report, for example, SIC code 3714, motor vehicle parts and accessories. These industries are grouped into broader categories at the three-digit and two-digit SIC code levels. For example, motor vehicle parts and accessories falls into the motor vehicles and motor vehicle equipment group at the three-digit level (SIC code 371) and the transportation equipment major group (SIC code 37). Tables in this chapter present data aggregated at the two-digit level.

TRI facilities may report up to six four-digit SIC codes that describe their operations. They submit one Form R or Form A certification statement for each chemical they are reporting. If all the processes or operations that are associated with a facility's releases or other waste management of a TRI chemical can be described by one SIC code, then only one SIC code is reported on the form. If several economic activities, designated by different SIC codes, describe the specific operations at a facility that are associated with releases or other waste management of a TRI chemical, then the facility will report those SIC codes (up to six) on the form it submits for that chemical.

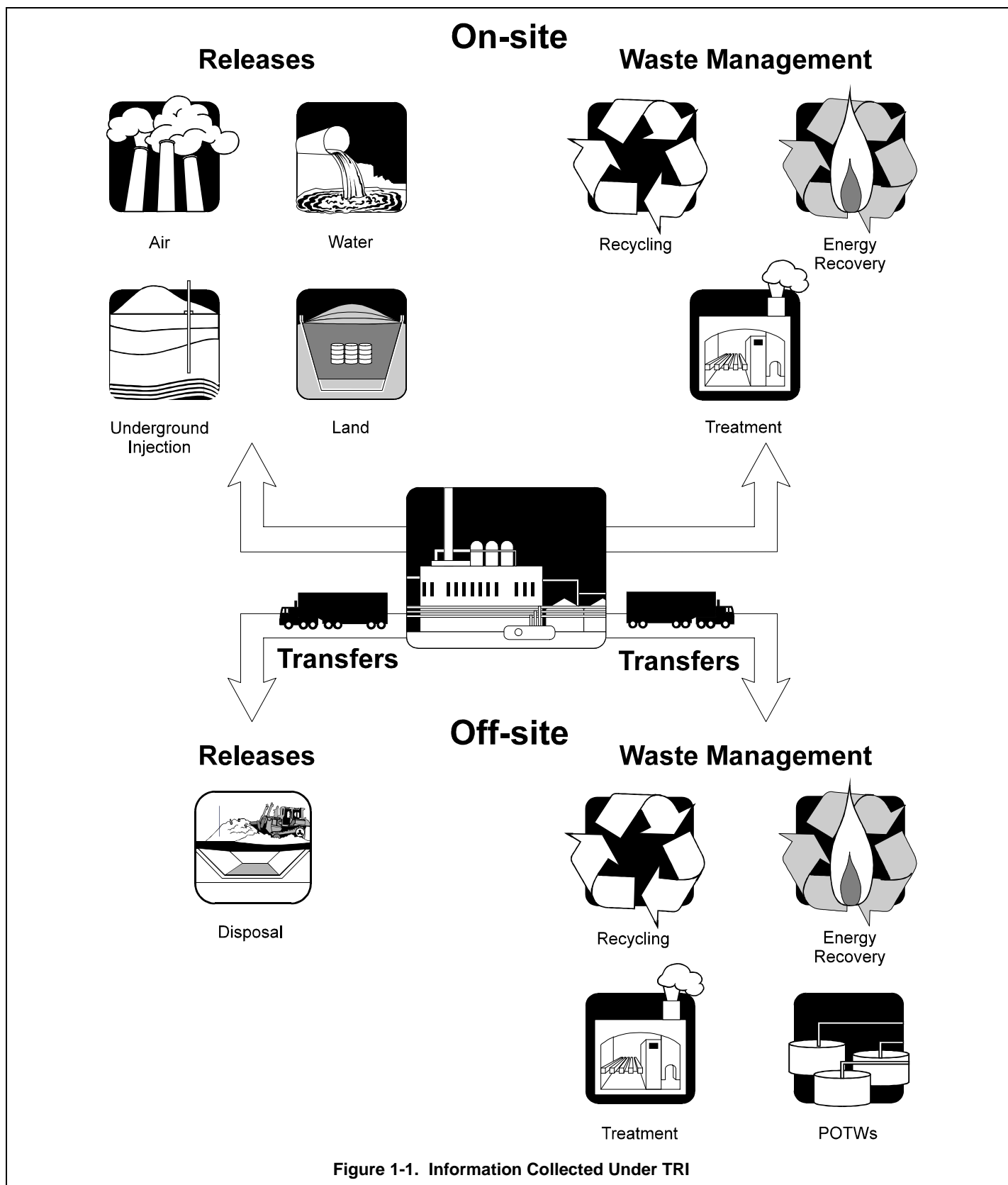
Industrial facilities often conduct inter-related operations. They may, for example, manufacture distinct products using common or related feedstocks. Such products may be classified in similar but separate categories in the SIC system. Thus, many forms submitted to TRI contain more than one industrial classification. When TRI data are analyzed by industry—that is, by SIC code—forms that report more than one SIC code must be categorized separately because they do not fall into the individual industry groups. This affects analyses at the four-digit level, as presented in Chapters 2 through 16, and it affects analyses when data are aggregated at the two-digit level, as in this chapter.

**Four-digit Multiple SIC Codes:** Forms that report multiple SIC codes within the same two-digit SIC codes are categorized as “multiple codes” in the analyses of TRI data in Chapters 2 through 16. A facility that makes vehicle bodies for both cars and trucks will report both SIC code 3711 (motor vehicles and passenger car bodies) and SIC code 3713 (truck and bus bodies). In the analyses in Chapter 14 of TRI reporting in the transportation equipment sector (SIC code 37), data from these forms are included in the “multiple-codes” category. In some industrial sectors, such as chemical manufacturing (SIC code 28, analyzed in Chapter 6 of the May 1996 TRI Public Data Release), the majority of TRI reporting occurs on forms with multiple SIC codes at the four-digit level.

**Two-digit Multiple SIC Codes:** In this chapter, the “multiple codes” category represents forms that report in more than one two-digit SIC code. For example, a facility may manufacture motor vehicle parts (in SIC code 37) and also fabricate other metal products (in SIC code 34); it will report SIC codes in both of these sectors on its TRI forms (such as SIC codes 3714 (motor vehicle parts and accessories) and 3465 (automotive stampings)). Data from these forms are classified in the “multiple codes” category in this chapter, where the tables analyze the TRI data at the two-digit level. In this chapter, TRI forms from the facility that manufactures vehicle bodies for both cars and trucks would be included in SIC code 37, because both of its four-digit SIC codes (SIC code 3711 and SIC code 3713) fall within SIC code 37.

On forms with more than one SIC code, any SIC code that is not within manufacturing (that is, not within the SIC code range 20 to 39) is ignored when assigning a form to an industry category. For example, a form with the SIC code 3241 (manufacture of hydraulic cement) and SIC code 4953 (refuse systems) would be included in SIC code 3241 in Chapter 11 and in SIC code 32 in this chapter. (In this example, the facility would be a waste incinerator that collects and burns refuse to fuel a cement kiln.)

**Federal Facilities:** Federal facilities report the SIC codes that describe their activity; these may or may not fall within the manufacturing categories, SIC codes 20 to 39, that have reported to TRI since its inception. (As explained earlier in this chapter, additional industries will begin reporting with the 1998 reporting year.) Tables in this chapter incorporate amounts submitted by federal facilities in the SIC codes they reported, just as is done for private sector facilities. In each table, a separate summary of federal facilities' data is presented as well, following the totals.





**Box 1-6. An Explanation of On- and Off-site Releases**

**An Explanation of On- and Off-site Releases**

A release is a discharge of a toxic chemical to the environment. On-site releases include emissions to the air, discharges to bodies of water, releases at the facility to land, as well as into underground injection wells. Releases are reported to TRI by media type. Chemicals in waste transferred off-site for disposal are also released to the environment. On- and off-site releases thus include releases to the environment at the facility (reported in Section 5 for Form R) plus off-site transfers to disposal (reported in Section 6 of Form R).

**Air Emissions.** Releases to air are reported either as point source or fugitive emissions. Point source emissions, also referred to as stack emissions, occur through confined air streams, such as stacks, vents, ducts, or pipes. Fugitive emissions are all releases to air that are not released through a confined air stream. Fugitive emissions include equipment leaks, evaporative losses from surface impoundments and spills, and releases from building ventilation systems.

**Surface Water Discharges.** Releases to water include discharges to streams, rivers, lakes, oceans, and other bodies of water. This includes releases from contained sources, such as industrial process outflow pipes or open trenches. Releases due to runoff, including stormwater runoff, are also reportable to TRI.

**Underground Injection.** Underground injection is the subsurface emplacement of fluids through wells. TRI chemicals associated with manufacturing, the petroleum industry, mining, commercial and service industries, and Federal and municipal government related activities may be injected into Class I, II, III, IV or V wells, if they do not endanger underground sources of drinking water (USDW), public health or the environment. The different types of authorized injection activities are described below:

- Class I industrial, municipal and manufacturing wells inject fluids into deep, confined and isolated formations below potable water supplies.
- Class II oil and gas related wells which re-inject produced fluids for disposal, enhanced recovery of oil, or hydrocarbon storage.
- Class III wells are associated with the solution mining of minerals.
- Class IV wells may inject hazardous or radioactive fluids directly or indirectly into USDW, only if the injection is part of an authorized CERCLA/RCRA clean up operation.
- Class V wells, which include all types of injection wells which do not fall under I - IV, may inject only if they do not endanger USDW, public health or the environment. Class V wells are, generally, shallow drainage wells, such as floor drains connected to dry wells or drain fields.

Beginning with the 1996 reporting year, facilities separately report amounts injected into Class I wells and into all other wells.

**On-site Land Releases.** On-site releases to land occur within the boundaries of the reporting facility. Releases to land include disposal of toxic chemicals in landfills (in which wastes are buried), land treatment/application farming (in which a waste containing a listed chemical is applied to or incorporated into soil), surface impoundments (which are uncovered holding areas used to volatilize and/or settle waste materials), and other land disposal methods (such as waste piles) or releases to land (such as spills or leaks). Beginning with the 1996 reporting year, facilities separately report amounts released to RCRA Subtitle C landfills from amounts released to other on-site landfills.

**Transfers Off-site to Disposal.** Toxic chemicals in waste that are transferred to a facility for disposal generally are either released to land at an off-site facility or are injected underground.

**Box 1-7. An Explanation of On-site Waste Management****An Explanation of On-site Waste Management**

On-site waste management activities are reported in Section 8 of Form R. These amounts do not include one-time events such as accidental releases or remediation (clean-up).

**Recycled On-site.** This is the quantity of the toxic chemical recovered at the facility and made available for further use. It is not the quantity that entered an on-site recycling or recovery operation.

**Used for Energy Recovery On-site.** This is the quantity of the toxic chemical that was combusted in some form of energy recovery device, such as a furnace (including kilns) or boiler. The toxic chemical should have a heating value high enough to sustain combustion. To avoid double-counting, the amount reported represents the amount destroyed in the combustion process, not the amount that entered the energy recovery unit. For example, 100,000 pounds of toluene entered a boiler that, on average, combusted 98% of the toluene. Any remaining toluene was discharged to air. A total of 98,000 pounds is reported as combusted for energy recovery (the remaining 2,000 pounds is reported as released).

**Treatment On-site.** This is the quantity of the toxic chemical destroyed in on-site waste treatment operations, not the amount that entered any treatment operation. For example, if 100,000 pounds of benzene were combusted in an incinerator that destroyed 99% of the benzene, the facility would report 99,000 pounds as treated on-site (the remaining 1,000 pounds would be reported as released).

**Box 1-8. An Explanation of Transfers Off-site for Further Waste Management****An Explanation of Transfers Off-site for Further Waste Management**

An off-site transfer, reported in Section 6 of Form R, is the transfer of toxic chemicals in waste to a facility that is geographically or physically separate from the facility reporting under TRI. Chemicals reported to TRI as transferred are sent to off-site facilities for the purposes of recycling, energy recovery, treatment, or disposal. The quantities reported represent a movement of the chemical away from the reporting facility. Except for off-site transfers to disposal, these quantities do not necessarily represent entry of the chemical into the environment. Transfers to disposal represent an off-site release (see Box 1-6).

**Transfers Off-site to Recycling.** Toxic chemicals in waste that are sent off-site for the purposes of recycling are generally recovered by a variety of recycling methods, including solvent recovery and metals recovery. The choice of the recycling method depends on the toxic chemical being sent for recycling. Once they have been recycled, these chemicals may be returned to the originating facility for further processing or made available for use in commerce.

**Transfers Off-site to Energy Recovery.** Toxic chemicals in waste sent off-site for purposes of energy recovery are combusted off-site in industrial furnaces (including kilns) or boilers that generate heat or energy for use at that location. Treatment of a chemical by incineration is not considered to be energy recovery.

**Transfers Off-site to Treatment.** Toxic chemicals in waste that are transferred off-site may be treated through a variety of methods, including biological treatment, neutralization, incineration, and physical separation. These methods typically result in varying degrees of destruction of the toxic chemical. In some cases (such as stabilization or solidification), the chemical is not destroyed but is prepared for further waste management, such as contained disposal.

**Transfers to Publicly Owned Treatment Works (POTWs).** A POTW is a wastewater treatment facility that is owned by a state or municipality. Wastewaters from facilities reporting under TRI are transferred through pipes or sewers to a POTW. Treatment or removal of a chemical from the wastewater depends upon the nature of the chemical, as well as the treatment methods present at the POTW. In general, chemicals that are easily utilized as nutrients by microorganisms, or have a low solubility in water, are likely to be removed to some extent. Chemicals that are volatile and have a low solubility in water may evaporate into the atmosphere. Not all TRI chemicals can be treated or removed by a POTW. Some chemicals, such as metals, may be removed, but are not destroyed and may be disposed of in landfills or discharged to receiving waters.

**Other Off-site Transfers.** In this report, toxic chemicals in waste that were reported as transferred off-site but for which the off-site activity (i.e., treatment, disposal, energy recovery, or recycling) was not specified or was not an accepted code have been classified as “other off-site transfers.”



### Differences between Amounts Reported in Sections 5 and 6 and in Section 8 in Form R

Generally, the total of the on-site releases that a facility reports in Section 5, plus transfers off-site to disposal that it reports in Section 6 (designated off-site releases in this publication), should equal the quantity released on- and off-site that it reports in Section 8.1. Further, transfers to recycling, energy recovery, and treatment (including POTWs) reported in Section 6 should correspond to reporting of off-site recycling, energy recovery, and treatment in Section 8.

Differences arise for several reasons. Reporting in Sections 5 and 6 includes releases and transfers resulting from remedial actions or other one-time events; these are reported separately in Section 8. A release or transfer of less than 1,000 pounds of a chemical may be reported as a range rather than an exact amount in Sections 5 and 6. Furthermore, facilities can round off the quantities they report in Section 8 to two significant digits. In addition, some facilities may not understand that certain amounts or totals that a facility reports in Sections 5 and 6 should correspond to amounts reported in the current-year column of Section 8, as described above.

### TRI Chemicals

In 1994, for the 1995 reporting year, EPA added nearly 300 chemicals and chemical categories to TRI. This expansion nearly doubled the TRI chemical list. Specifically, EPA added more than 150 pesticides, certain Clean Air Act chemicals, certain Clean Water Act Priority Pollutants, and certain Safe Drinking Water Act chemicals. These included carcinogens, reproductive toxicants, and developmental toxicants. The 1996 data release covers the second year in which facilities have reported on these chemicals.

### **OSHA Carcinogens**

Some chemicals are listed in TRI because they are either known human carcinogens or suspect carcinogens. Known human carcinogens are those that have been shown to cause cancer in humans. Suspect carcinogens are those that have been shown to cause cancer in animals. TRI thresholds for reporting known and suspect carcinogens in mixtures are lower than for other substances.

When a TRI chemical occurs in a mixture, it is reportable only if the concentration of the chemical in the mixture is above a specified percentage. For non-carcinogenic TRI chemicals, this concentration is 1.0%. In establishing reporting requirements for substances designated as carcinogens, EPA adopted the limitation set by the Occupational Safety and Health Administration's (OSHA) Hazard Communication Standards (29 CFR 1910.1200) because much of the information that industry would have relating to chemicals in a mixture would be from the material safety data sheet (MSDS).

Under OSHA standards, the "*de minimis*" concentration for substances designated as carcinogens is 0.1%. At a concentration of 0.1% or more, a TRI chemical that is an OSHA carcinogen must be included in facilities' calculations of threshold and release amounts. The OSHA limitation applies if the chemical is a known or suspect carcinogen by virtue of appearing in one of three sources:

1. National Toxicology Program (NTP), "Annual Report on Carcinogens" (Latest Edition);
2. International Agency for Research on Cancer (IARC) "Monographs" (Latest Editions); or
3. 29 CFR 1910, Subpart Z, Toxic and Hazardous Substances, Occupational Safety and Health Administration.

Box 1-9 lists the OSHA carcinogens and the bases for their designation.



**Box 1-9. Basis of OSHA Carcinogen Listing for Individual Chemicals**

Chemical	IARC	NTP	OSHA	Chemical	IARC	NTP	OSHA
Acetaldehyde	2B	P	—	2,4-D chlorocrotyl ester†	2B	—	—
Acetamide	2B	—	—	2,4-D 2-ethylhexyl ester†	2B	—	—
2-Acetylaminofluorene	—	P	Z	2,4-D 2-ethyl-4-methylpentyl ester†	2B	—	—
Acrylamide	2A	P	—	2,4-Diaminoanisole	2B	—	—
Acrylonitrile	2A	P	Z	2,4-Diaminoanisole sulfate	—	P	—
2-Aminoanthraquinone	—	P	—	4,4'-Diaminodiphenyl ether	2B	—	—
4-Aminoazobenzene	2B	—	—	2,4-Diaminotoluene	2B	P	—
4-Aminobiphenyl	1	K	Z	Diaminotoluene (mixed isomers)	2B	P	—
1-Amino-2-methylantraquinone	—	P	—	1,2-Dibromo-3-chloropropane	2B	P	Z
Amitrole	2B	P	—	1,2-Dibromoethane	2A	P	—
o-Anisidine	2B	—	—	1,4-Dichlorobenzene	2B	P	—
o-Anisidine hydrochloride	—	P	—	Dichlorobenzene (mixed isomers)	2B	P	—
Arsenic and inorganic arsenic compounds	1	K†	Z	3,3'-Dichlorobenzidine	2B	P	Z
Asbestos (friable)	1	K	Z	3,3'-Dichlorobenzidine dihydrochloride	2B	P	—
Atrazine	2B	—	—	3,3'-Dichlorobenzidine sulfate	2B	P	—
Benzene	1	K	Z	1,2-Dichloroethane	2B	P	—
Benzidine	1	K	Z	Dichloromethane	2B	P	—
Benzoic trichloride	2B	P	—	trans-1,3-Dichloropropene	2B	—	—
Beryllium and beryllium compounds	1	P†	—	1,3-Dichloropropene	2B	P	—
Bis(chloromethyl)ether	1	K	Z	Dichlorvos	2B	—	—
1,3-Butadiene	2A	P	—	Diepoxybutane	2B	P	—
C.I. Acid Red 114	2B	—	—	Di-(2-ethylhexyl)phthalate	2B	P	—
C.I. Direct Black 38	2A	P	—	Diethyl sulfate	2A	P	—
C.I. Direct Blue 6	2A	P	—	Diglycidyl resorcinol ether	2B	P	—
C.I. Direct Brown 95	2A	—	—	Dihydrosafrole	2B	—	—
C.I. Food Red 5	2B	—	—	3,3'-Dimethoxybenzidine	2B	P	—
C.I. Solvent Yellow 34 (Auramine)	2B	—	—	3,3'-Dimethoxybenzidine dihydrochloride	2B	P	—
Cadmium and cadmium compounds	1	P†	—	3,3'-Dimethoxybenzidine hydrochloride	2B	P	—
Carbon tetrachloride	2B	P	—	4-Dimethylaminoazobenzene	2B	P	Z
Chlordane	2B	—	—	3,3'-Dimethylbenzidine	2B	P	—
Chlorendic acid	2B	P	—	3,3'-Dimethylbenzidine dihydrochloride	2B	P	—
p-Chloroaniline	2B	—	—	3,3'-Dimethylbenzidine dihydrofluoride	2B	P	—
Chloroform	2B	P	—	Dimethylcarbaryl chloride	2A	P	—
Chloromethyl methyl ether	1	K	Z	N,N-Dimethylformamide	2B	—	—
3-Chloro-2-methyl-1-propene	—	P	—	1,1-Dimethylhydrazine	2B	P	—
Chlorophenols	2B	—	—	Dimethyl sulfate	2A	P	—
p-Chloro-o-toluidine	2B	—	—	1,4-Dioxane	2B	P	—
Chromium (VI) compounds	1	K	—	1,2-Diphenylhydrazine	—	P	—
Cobalt and cobalt compounds	2B	—	—	2,4-D isopropyl ester†	2B	—	—
Creosote	2A	—	—	2,4-DP†	2B	—	—
p-Cresidine	2B	P	—	2,4-D propylene glycol butyl ether ester†	2B	—	—
Cupferron	—	P	—	2,4-D sodium salt†	2B	—	—
2,4-D†	2B	—	—	Epichlorohydrin	2A	P	—
2,4-D butoxyethyl ester†	2B	—	—	Ethyl acrylate	2B	P	—
2,4-D butyl ester†	2B	—	—	Ethyleneimine	—	—	Z

**Note:** The list of TRI chemicals meeting the OSHA carcinogen standard and, therefore, reported when in a mixture at a concentration level below the *de minimis* level of 0.1%, has been updated, and this list reflects the update.

**IARC:** 1—The chemical is carcinogenic to humans; 2A—The chemical is probably carcinogenic to humans; 2B—The chemical is possibly carcinogenic to humans.

**NTP:** K—The chemical is known to be carcinogenic; P—The chemical may reasonably be anticipated to be carcinogenic.

**OSHA:** Z—The chemical appears at 29 CFR Part 1910 Subpart Z.

† Certain compounds.

‡ Chlorophenoxy herbicides (IARC 2B).



## Chapter 1 — Toxics Release Inventory Data by Industry

**Box 1-9. Basis of OSHA Carcinogen Listing for Individual Chemicals, Continued**

Chemical	IARC	NTP	OSHA	Chemical	IARC	NTP	OSHA
Ethylene oxide	1	P	Z	Benzo(j)fluoranthene	2B	P	—
Ethylene thiourea	2B	P	—	Benzo(k)fluoranthene	2B	—	—
Formaldehyde	2A	P	Z	Benzo(rst)pentaphene	2B	—	—
Heptachlor	2B	—	—	Benzo(a)pyrene	2A	P	—
Hexachlorobenzene	2B	P	—	Dibenz(a,h)acridine	2A	P	—
Hexamethylphosphoramide	2B	P	—	Dibenz(a,j)acridine	2B	P	—
Hydrazine	2B	P	—	Dibenzo(a,h)anthracene	2B	P	—
Hydrazine sulfate	—	P	—	7H-Dibenzo(c,g)carbazole	2B	P	—
Lead and inorganic lead compounds	2B	—	Z	Dibenzo(a,e)pyrene	2B	P	—
Lindane	2B	P	—	Dibenzo(a,h)pyrene	2B	P	—
Mecoprop†	2B	—	—	Dibenzo(a,l)pyrene	2B	P	—
Methoxone†	2B	—	—	7,12-Dimethylbenz(a)anthracene	2B	—	—
Methoxone sodium salt‡	2B	—	—	Indeno[1,2,3-cd]pyrene	2B	P	—
4,4'-Methylenebis (2-chloroaniline)	2A	P	—	5-Methylchrysene	2B	P	—
4,4'-Methylenebis (N,N-dimethyl) benzeneamine	2B	P	—	1-Nitropyrene	2B	—	—
4,4'-Methylenedianiline	2B	P	Z	Potassium bromate	2B	—	—
Michler's ketone	—	P	—	Propane sultone	2B	P	—
Mustard gas	1	K	—	beta-Propiolactone	2B	P	Z
alpha-Naphthylamine	—	—	Z	Propyleneimine	2B	P	—
beta-Naphthylamine	1	K	Z	Propylene oxide	2B	P	—
Nickel	2B	P	—	Saccharin (manufacturing)	2B	P	—
Nickel compounds	1	P†	—	Safrole	2B	P	—
Nitrilotriacetic acid	—	P	—	Sodium o-phenylphenoxide	2B	—	—
4-Nitrobiphenyl	—	—	Z	Styrene	2B	—	—
Nitrofen	2B	P	—	Styrene oxide	2A	—	—
Nitrogen mustard	2A	—	—	Tetrachloroethylene	2B	P	—
2-Nitropropane	2B	P	—	Thioacetamide	2B	P	—
N-Nitrosodi-n-butylamine	2B	P	—	4,4'-Thiodianiline	2B	P	—
N-Nitrosodiethylamine	2A	P	—	Thiourea	2B	P	—
N-Nitrosodimethylamine	2A	P	Z	Toluene-2,4-diisocyanate	2B	P	—
N-Nitrosodi-n-propylamine	2B	P	—	Toluene-2,6-diisocyanate	2B	P	—
N-Nitroso-N-ethylurea	2A	P	—	Toluene diisocyanate (mixed isomers)	2B	P	—
N-Nitroso-N-methylurea	2A	P	—	o-Toluidine	2B	P	—
N-Nitrosomethylvinylamine	2B	P	—	o-Toluidine hydrochloride	—	P	—
N-Nitrosomorpholine	2B	P	—	Toxaphene	2B	P	—
N-Nitrosornicotine	2B	P	—	Trichloroethylene	2A	—	—
N-Nitrosopiperidine	2B	P	—	2,4,6-Trichlorophenol	2B	P	—
Pentachlorophenol	2B	—	—	1,2,3-Trichloropropane	2A	—	—
Phenytoin	2B	P	—	Tris(2,3-dibromopropyl)phosphate	2A	P	—
Polybrominated biphenyls (PBBs)	2B	P	—	Trypan blue	2B	—	—
Polychlorinated biphenyls (PCBs)	2A	P	—	Urethane	2B	P	—
Polycyclic aromatic compounds (PACs):				Vinyl acetate	2B	—	—
Benz(a)anthracene	2A	P	—	Vinyl bromide	2A	—	—
Benzo(b)fluoranthene	2B	P	—	Vinyl chloride	1	K	Z
				2,6-Xylidine	2B	—	—

**Note:** The list of TRI chemicals meeting the OSHA carcinogen standard and, therefore, reported when in a mixture at a concentration level below the *de minimis* level of 0.1%, has been updated, and this list reflects the update.

IARC: 1—The chemical is carcinogenic to humans; 2A—The chemical is probably carcinogenic to humans; 2B—The chemical is possibly carcinogenic to humans.

NTP: K—The chemical is known to be carcinogenic; P—The chemical may reasonably be anticipated to be carcinogenic.

OSHA: Z—The chemical appears at 29 CFR Part 1910 Subpart Z.

† Certain compounds.

‡ Chlorophenoxy herbicides (IARC 2B)

**Table 1-1. TRI Facilities and Forms, by Industry, 1996**

SIC Code	Industry	Total Facilities Number	Total Forms Number	Form Rs Number	Form As Number
20	Food	1,993	3,541	2,545	996
21	Tobacco	29	61	61	0
22	Textiles	307	657	622	35
23	Apparel	25	51	49	2
24	Lumber	765	1,926	1,446	480
25	Furniture	453	1,250	1,224	26
26	Paper	491	2,363	2,250	113
27	Printing	241	483	475	8
28	Chemicals	3,855	21,098	18,288	2,810
29	Petroleum	401	3,231	2,990	241
30	Plastics	1,824	3,747	3,404	343
31	Leather	89	223	209	14
32	Stone/Clay/Glass	640	1,716	1,517	199
33	Primary Metals	1,902	6,603	6,138	465
34	Fabricated Metals	2,883	7,416	6,895	521
35	Machinery	1,087	2,791	2,619	172
36	Electrical Equip.	1,233	3,121	3,031	90
37	Transportation Equip.	1,248	4,331	4,117	214
38	Measure./Photo.	291	707	661	46
39	Miscellaneous	362	766	710	56
	Multiple Codes 20-39	1,271	4,520	4,195	325
	No Codes 20-39	236	779	701	78
	Total	21,626	71,381	64,147	7,234
	Federal Facilities	133	378	350	28

**Note:** Facilities/forms that reported more than one 2-digit SIC code within the range 20 to 39 are assigned to the “multiple” category. Facilities/forms with no 2-digit SIC code within the range of 20 to 39 are assigned to the “no codes 20-39” category.

## Industry Overview

### TRI Data by Industry, 1996

In 1996, a total of 21,626 facilities submitted 71,381 forms to TRI, as shown in Table 1-1. About one-tenth of these were Form A certifications. (Facilities submit one Form R or one Form A certification statement, explained above, for each chemical.)

### On- and Off-site Releases

As shown in Table 1-2, on- and off-site releases by all industry sectors totaled 2.43 billion pounds in 1996. This included 1.45 billion pounds of air emissions (355.3 million pounds from fugitive sources and 1.10 billion pounds from stack or point sources). Discharges to surface water totaled 173.3 million pounds.

Reporting year 1996 was the first year in which facilities distinguished their releases to underground injection by type of well (Class I and Class II-V wells) and identified their releases to RCRA subtitle C landfills as a separate category among on-site



## Chapter 1 — Toxics Release Inventory Data by Industry

**Table 1-2. TRI On-site and Off-site Releases, by Industry, 1996**

SIC Code	Industry	On-site Releases								Off-site Releases	Total On-and Off-site Releases
		Air		Surface Water Discharges	On-site Releases to Land						
		Fugitive or Nonpoint Air Emissions Pounds	Stack or Point Air Emissions Pounds		Class I Wells Pounds	Class II-V Wells Pounds	Subtitle C Landfills Pounds	Other On-site Land Releases Pounds	Total On-site Releases Pounds	Transfers Off-site to Disposal Pounds	
20	Food	21,810,437	47,255,169	8,983,229	1,010	29,548	28,506	4,438,103	82,546,002	757,393	83,303,395
21	Tobacco	61,394	3,453,344	179,701	0	0	0	0	3,694,439	458,133	4,152,572
22	Textiles	3,217,057	13,125,828	348,877	0	0	0	173,620	16,865,382	462,148	17,327,530
23	Apparel	130,287	1,663,532	7,320	0	0	0	534	1,801,673	63,177	1,864,850
24	Lumber	4,636,576	23,856,213	76,874	0	0	6,039	9,807	28,585,509	7,657,171	36,242,680
25	Furniture	4,813,779	30,910,342	43	0	0	0	26,641	35,750,805	125,858	35,876,663
26	Paper	18,227,534	185,722,017	16,008,715	0	0	602,265	4,160,489	224,721,020	2,842,352	227,563,372
27	Printing	13,782,537	14,579,092	1,670	0	0	0	13,650	28,376,949	89,070	28,466,019
28	Chemicals	93,363,107	299,070,993	90,420,803	200,317,453	197,441	2,689,697	68,276,606	754,336,100	30,842,063	785,178,163
29	Petroleum	27,968,469	24,132,610	10,567,225	2,310,233	8,664	5,685	1,236,941	66,229,827	2,657,431	68,887,258
30	Plastics	27,540,757	77,774,998	27,815	750	0	48,918	398,367	105,791,605	10,617,686	116,409,291
31	Leather	747,962	1,906,965	53,526	0	0	0	6,611	2,715,064	1,526,825	4,241,889
32	Stone/Clay/Glass	1,870,677	28,158,910	45,443	500	500	105,977	2,416,616	32,598,623	6,141,803	38,740,426
33	Primary Metals	38,722,723	105,958,141	31,988,843	930,779	0	22,192,029	193,591,686	393,384,201	171,150,982	564,535,183
34	Fabricated Metals	23,613,262	45,578,614	351,080	563	7	204,331	572,609	70,320,466	19,933,901	90,254,367
35	Machinery	6,665,652	12,373,145	34,089	0	0	7,144	121,101	19,201,131	2,859,589	22,060,720
36	Electrical Equip.	6,351,489	17,401,668	1,462,615	22	5	210,430	225,890	25,652,119	16,113,258	41,765,377
37	Transportation Equip.	28,283,393	74,410,242	224,148	0	0	86,685	618,616	103,623,084	7,729,685	111,352,769
38	Measure./Photo.	2,698,043	10,503,368	1,297,561	0	0	0	2,531	14,501,503	848,568	15,350,071
39	Miscellaneous	1,929,982	7,478,283	2,364	0	0	11,957	8,189	9,430,775	839,283	10,270,058
Multiple Codes 20-39		26,982,381	66,599,536	10,964,363	11,400	10	180,840	5,680,956	110,419,486	10,359,532	120,779,018
No Codes 20-39		1,854,254	4,905,200	241,905	0	520,224	74,466	628,674	8,224,723	660,188	8,884,911
Total		355,271,752	1,096,818,210	173,288,209	203,572,710	756,399	26,454,969	282,608,237	2,138,770,486	294,736,096	2,433,506,582
Federal Facilities		2,463,277	1,831,564	384,602	0	505,541	23,516	681,351	5,889,851	612,797	6,502,648

**Note:** On-site Releases from Section 5 of Form R and Off-site Releases from Section 6 (transfers off-site to disposal) of Form R. Forms that reported more than one 2-digit SIC code within the range of 20 to 39 are assigned to the “multiple” category. Forms with no 2-digit SIC code within the range of 20 to 39 are assigned to the “no codes 20-39” category.

land releases. (These are explained in Box 1-6.) Underground injection in 1996 totaled 204.3 million pounds and 99.6% of the total was reported as injected into Class I wells. Land releases were 309.1 million pounds, including 26.5 million pounds released to RCRA subtitle C landfills.

Off-site releases (transfers to disposal) totaled 294.7 million pounds in 1996.

### Other On-site Waste Management

A total of 17.74 billion pounds was reported in other on-site waste management in 1996, as shown in Table 1-3. The largest amount was reported in recycling, with 7.84 billion pounds, followed by

treatment, with 7.14 billion pounds. Energy recovery amounted to 2.76 billion pounds.

### Transfers Off-site for Further Waste Management

TRI facilities reported a total of 3.16 billion pounds in transfers off-site for further waste management in 1996. The largest amount reported was in transfers to recycling, with 2.15 billion pounds. The amount reported as transferred to energy recovery was 477.1 million pounds. Transfers to treatment were 290.1 million pounds, and those to POTWs were 235.8 million pounds. These data appear in Table 1-4.



Table 1-3. TRI Other On-site Waste Management, by Industry, 1996

SIC Code	Industry	Recycled On-site Pounds	Energy Recovery On-site Pounds	Treated On-site Pounds	Total Other On-site Waste Management Pounds
20	Food	216,405,632	411,710	75,715,014	292,532,356
21	Tobacco	9,753	0	1,329,064	1,338,817
22	Textiles	13,085,659	5,326,659	23,627,782	42,040,100
23	Apparel	190,976	600	1,049,762	1,241,338
24	Lumber	50,544,925	1,538,386	23,482,107	75,565,418
25	Furniture	2,841,917	37,467	1,181,030	4,060,414
26	Paper	104,481,896	184,352,318	1,022,099,101	1,310,933,315
27	Printing	168,501,410	203,536	61,721,672	230,426,618
28	Chemicals	3,731,246,814	1,348,429,666	3,254,527,247	8,334,203,727
29	Petroleum	153,400,536	603,601,392	1,305,533,526	2,062,535,454
30	Plastics	162,062,640	19,598,143	39,036,343	220,697,126
31	Leather	604,322	0	3,620,694	4,225,016
32	Stone/Clay/Glass	149,823,758	445,258,980	22,702,838	617,785,576
33	Primary Metals	2,092,485,352	49,768,460	625,844,126	2,768,097,938
34	Fabricated Metals	148,030,876	20,976,980	113,727,254	282,735,110
35	Machinery	49,613,047	130,702	9,438,553	59,182,302
36	Electrical Equip.	148,298,966	11,424,647	78,313,464	238,037,077
37	Transportation Equip.	16,523,234	1,458,959	29,517,152	47,499,345
38	Measure./Photo.	3,960,735	938,685	37,645,252	42,544,672
39	Miscellaneous	16,533,257	3,362,337	4,770,453	24,666,047
	Multiple Codes 20-39	609,928,425	40,337,718	388,721,568	1,038,987,711
	No Codes 20-39	4,021,012	24,582,100	16,257,919	44,861,031
	Total	7,842,595,142	2,761,739,445	7,139,861,921	17,744,196,508
	Federal Facilities	12,169,917	7,700	9,650,204	21,827,821

**Note:** Other On-site Waste Management from Section 8 of Form R. Forms that reported more than one 2-digit SIC code within the range of 20 to 39 are assigned to the “multiple” category. Forms with no 2-digit SIC code within the range of 20 to 39 are assigned to the “no codes 20-39” category.

Table 1-4. TRI Transfers Off-site for Further Waste Management, by Industry, 1996

SIC Code	Industry	Transfers to Recycling Pounds	Transfers to Energy Recovery Pounds	Transfers to Treatment Pounds	Transfers to POTWs Pounds	Other Off-site Transfers Pounds	Total Transfers Off-site for Further Waste Management Pounds
20	Food	1,816,235	267,672	1,286,750	20,311,887	750	23,683,294
21	Tobacco	165,113	0	56,491	267,349	0	488,953
22	Textiles	1,013,876	1,926,069	523,939	2,287,565	0	5,751,449
23	Apparel	1,440	139,653	535	255	0	141,883
24	Lumber	515,208	2,299,252	491,157	32,799	12,036	3,350,452
25	Furniture	6,453,880	5,612,741	601,162	383,502	6,295	13,057,580
26	Paper	2,180,119	7,495,656	9,983,082	40,311,407	0	59,970,264
27	Printing	3,642,455	3,670,369	382,262	242,411	0	7,937,497
28	Chemicals	256,639,247	378,369,918	154,280,145	109,463,055	104,516	898,856,881
29	Petroleum	18,553,327	657,071	2,150,251	4,788,134	1	26,148,784
30	Plastics	11,817,283	6,750,688	3,169,307	2,890,863	24,575	24,652,716
31	Leather	337,555	167,073	29,024	1,290,230	0	1,823,882
32	Stone/Clay/Glass	3,672,150	2,865,219	2,987,594	1,019,855	16,497	10,561,315
33	Primary Metals	796,078,608	5,643,584	66,153,726	7,859,057	263,705	875,998,680
34	Fabricated Metals	303,449,098	13,729,060	12,677,769	6,597,522	88,546	336,541,995
35	Machinery	64,012,061	2,530,890	1,316,961	4,168,245	2,025,681	74,053,838
36	Electrical Equip.	345,621,345	8,084,043	7,294,538	10,998,130	694,794	372,692,850
37	Transportation Equip.	164,986,403	13,944,925	8,676,026	5,577,802	8,146	193,193,302
38	Measure./Photo.	12,245,918	2,366,341	2,480,361	930,896	44,588	18,068,104
39	Miscellaneous	17,835,260	2,479,411	516,301	635,395	0	21,466,367
	Multiple Codes 20-39	135,247,125	15,615,643	14,128,226	15,248,528	15,500	180,255,022
	No Codes 20-39	4,310,288	2,441,292	911,221	508,621	750	8,172,172
	Total	2,150,593,994	477,056,570	290,096,828	235,813,508	3,306,380	3,156,867,280
	Federal Facilities	18,553,503	304,101	590,337	71,893	0	19,519,834

**Note:** Transfers Off-site for Further Waste Management from Section 6 (excluding transfers off-site to disposal) of Form R. Forms that reported more than one 2-digit SIC code within the range of 20-39 are assigned to the “multiple” category. Forms with no 2-digit SIC code within the range of 20 to 39 are assigned to the “no codes 20-39” category. Other Off-site Transfers are transfers reported without a valid waste management code.



## Chapter 1 — Toxics Release Inventory Data by Industry

**Table 1-5. Employees, Value of Shipments, and Total Production-related Waste, by Industry, 1996**

SIC Code	Industry	Employees		Value of Shipments		TRI Total Production-related Waste		Production-related Waste per Value of Shipments Pounds Per Million Dollar-Value
		Number	Percent	(\$000)	Percent	Pounds	Percent	
20	Food	1,516,600	8.8	461,324,200	12.4	397,557,868	1.8	862
21	Tobacco	31,400	0.2	34,481,700	0.9	5,921,753	0.0	172
22	Textiles	576,400	3.3	80,242,000	2.2	64,609,067	0.3	805
23	Apparel	864,900	5.0	77,628,100	2.1	3,273,589	0.0	42
24	Lumber	738,700	4.3	106,518,100	2.9	110,972,285	0.5	1,042
25	Furniture	514,500	3.0	55,696,700	1.5	57,823,940	0.3	1,038
26	Paper	630,600	3.6	160,661,000	4.3	1,599,797,509	7.3	9,958
27	Printing	1,515,000	8.7	195,435,200	5.3	266,207,152	1.2	1,362
28	Chemicals	824,400	4.8	367,441,800	9.9	10,032,390,027	45.6	27,303
29	Petroleum	106,000	0.6	174,284,600	4.7	2,155,301,359	9.8	12,367
30	Plastics	1,017,900	5.9	150,467,500	4.0	369,790,262	1.7	2,458
31	Leather	77,200	0.4	9,308,500	0.3	10,168,880	0.0	1,092
32	Stone/Clay/Glass	520,400	3.0	82,441,300	2.2	668,768,984	3.0	8,112
33	Primary Metals	687,400	4.0	178,297,800	4.8	4,184,091,672	19.0	23,467
34	Fabricated Metals	1,483,000	8.6	214,006,300	5.8	716,239,652	3.3	3,347
35	Machinery	1,980,500	11.4	381,793,700	10.3	169,485,752	0.8	444
36	Electrical Equip.	1,556,500	9.0	320,614,700	8.6	679,402,239	3.1	2,119
37	Transportation Equip.	1,466,900	8.5	465,172,200	12.5	355,169,310	1.6	764
38	Measure./Photo.	820,700	4.7	151,015,900	4.1	76,477,512	0.3	506
39	Miscellaneous	397,300	2.3	48,596,800	1.3	57,640,501	0.3	1,186
	Total	17,326,300	100.0	3,715,428,100	100.0	21,981,089,313	100.0	5,916

**Note:** Employees and Value of Shipments from U.S. Census Bureau, 1996 Annual Survey of Manufacturers. Total Production-related Waste from Section 8 (total of 8.1 through 8.7, Column B) of TRI Form R for 1996. Total Production-related Waste does not include forms reporting more than one 2-digit SIC code and forms reporting SIC codes outside the 20-39 range.

### Economic Overview, 1996

One limitation of TRI data is that, taken alone, they do not distinguish industry-specific factors that influence the chemicals, amounts, and types of releases and waste management facilities report. Each industry chapter in the two *1996 TRI Public Data Release* volumes offers some economic, technological, and regulatory information for that sector as a context for the data reported to TRI.

For each two-digit SIC code, Table 1-5 presents value of shipments and employment for 1996. These basic economic data suggest the relative size of the industrial sectors that now report to TRI. Economic analyses make use of value of shipments data as one way to indicate the size of industrial sectors, because no direct comparison can be drawn among products of those sectors. The dollar value of shipments provides a rough common measure between, for example, production of 10,000 pairs of shoes and production of 500,000 loaves of bread. Table 1-5 also includes total production-related waste reported to TRI for 1996 to allow

approximate comparison with the economic activity of the sectors. Percentages indicate the relative contribution of each sector to total employment and production (measured by the dollar-value of shipments) and to the total quantity of TRI chemicals in production-related waste reported to TRI. The ratio of total production-related waste to shipments, in the last column, compares the reported TRI quantities in each two-digit sector with that sector's production level for 1996. Many factors influence the differences in TRI reporting among industrial sectors. Relating TRI quantities to the dollar value of each sector's products takes into account one measure of the differences among sectors in their level of production in 1996.

TRI data are reported as absolute amounts each year, not as changes in relation to production levels or other factors, such as source reduction activity, that might influence these amounts from year to year. The industry chapters presented here, however, take a very basic look at changes in production as they may relate to increases and



decreases in releases and other waste management of TRI chemicals.

## Year-by-Year Comparisons, by Industry

### Comparing TRI Data Across Years

Comparisons of TRI data across reporting years are made on the basis of “core” chemicals that were reportable in all years with the same reporting definitions. This assures that apparent increases or decreases from one year to another are not the result of changes in the list of TRI chemicals.

EPA has the authority to add chemicals to the reporting list if they meet the statutory toxicity criteria and to delete chemicals from the list if EPA determines that they do not meet the toxicity criteria. Since 1987, EPA has deleted a number of chemicals from the list, added others, and modified the reporting requirements for others. The largest expansion has been the chemicals added beginning with the 1995 reporting year.

Year-to-year comparisons must be based on a consistent set of chemicals to assure that any changes in releases or other waste management do not simply reflect the addition, deletion, or change in definition of reportable chemicals from one year to another. Data in tables comparing TRI information across multiple years represent facility reporting only for the “core” chemicals for the years being compared. The set of “core” chemicals differs depending on which years are represented in the tables in this book.

#### 1995-1996 Comparisons

Tables comparing data for 1995 and 1996 include all chemicals currently reportable to TRI; there was no change in TRI’s chemical coverage between these two years. Thus, these tables include the nearly 300 chemicals added to TRI beginning with reporting year 1995. Because the chemical list has

not changed, 1996 totals in tables that present data for both years will be the same as in tables that present only the 1996 data.

#### Multi-Year Comparisons

Tables for 1988 to 1996 include only chemicals that were reportable in all years from 1988 through 1996. These tables do not include, for example, chemicals added in 1990, 1991, 1994, or 1995. Also, for 1989, non-fibrous forms of aluminum oxide were removed from the list. Because of this modification, aluminum oxide is not included in any year-to-year comparison that includes the year 1988. Reporting definitions for ammonia, hydrochloric acid and sulfuric acid have also changed, and they are therefore also not included in multi-year comparisons.

Similarly, tables that compare data for 1991 to 1996 do not include chemicals added in 1994 or 1995. These tables analyze TRI data only for the chemicals that were on the TRI list, in the same form, for all years 1991-1996.

Because of this normalization process, done to assure accurate year-to-year comparisons, totals for 1996 in the multi-year tables differ from the 1996 totals in tables that present only 1996 data or 1995-1996 data.

None of the tables include any chemical deleted from the TRI list, regardless of the year it was deleted.

## Year-by-Year Comparisons of TRI Data by Industry

### On- and Off-site Releases, 1995-1996

Table 1-6 summarizes on- and off-site releases by industry for 1995 and 1996. The net change for the period was a decrease of 97.3 million pounds, or 3.8%. Seven of the 20 industry groups (two-digit SIC codes), however, showed increases from 1995 to 1996.



## Chapter 1 — Toxics Release Inventory Data by Industry

**Table 1-6. Change in Total TRI On-site and Off-site Releases, by Industry, 1995-1996**

SIC Code	Industry	Total On- and Off-site Releases			
		1995 Pounds	1996 Pounds	Change 1995-1996	
				Pounds	Percent
20	Food	86,466,520	83,303,395	-3,163,125	-3.7
21	Tobacco	2,034,129	4,152,572	2,118,443	104.1
22	Textiles	18,501,494	17,327,530	-1,173,964	-6.3
23	Apparel	1,287,024	1,864,850	577,826	44.9
24	Lumber	34,834,946	36,242,680	1,407,734	4.0
25	Furniture	41,779,889	35,876,663	-5,903,226	-14.1
26	Paper	238,316,638	227,563,372	-10,753,266	-4.5
27	Printing	31,156,331	28,466,019	-2,690,312	-8.6
28	Chemicals	844,232,213	785,178,163	-59,054,050	-7.0
29	Petroleum	64,140,915	68,887,258	4,746,343	7.4
30	Plastics	127,167,993	116,409,291	-10,758,702	-8.5
31	Leather	4,475,689	4,241,889	-233,800	-5.2
32	Stone/Clay/Glass	32,323,553	38,740,426	6,416,873	19.9
33	Primary Metals	524,040,619	564,535,183	40,494,564	7.7
34	Fabricated Metals	97,038,621	90,254,367	-6,784,254	-7.0
35	Machinery	26,202,906	22,060,720	-4,142,186	-15.8
36	Electrical Equip.	40,455,697	41,765,377	1,309,680	3.2
37	Transportation Equip.	121,154,521	111,352,769	-9,801,752	-8.1
38	Measure./Photo.	17,858,774	15,350,071	-2,508,703	-14.0
39	Miscellaneous	13,868,918	10,270,058	-3,598,860	-25.9
	Multiple Codes 20-39	152,530,504	120,779,018	-31,751,486	-20.8
	No Codes 20-39	10,918,043	8,884,911	-2,033,132	-18.6
	Total	2,530,785,937	2,433,506,582	-97,279,355	-3.8
	Federal Facilities	7,801,971	6,502,648	-1,299,323	-16.7

**Note:** On-site Releases from Section 5 of Form R and Off-site Releases from Section 6 (transfers off-site to disposal) of Form R. Forms that reported more than one 2-digit code within the range of 20 to 39 are assigned to the "multiple" category. Forms with no 2-digit SIC code within the range of 20 to 39 are assigned to the "no codes 20-39" category.

### On- and Off-site Releases, 1988 and 1994-1996

From 1988 to 1996, on- and off-site releases decreased from 3.35 billion pounds to 1.82 billion pounds, as shown in Table 1-7, which summarizes release data for all sectors. (Federal facilities were not required to report before the 1994 reporting year.) This amounted to a reduction of 1.53 billion pounds, or 45.6%. From 1988 to 1996, on- and off-site releases decreased for all but one of the sectors.

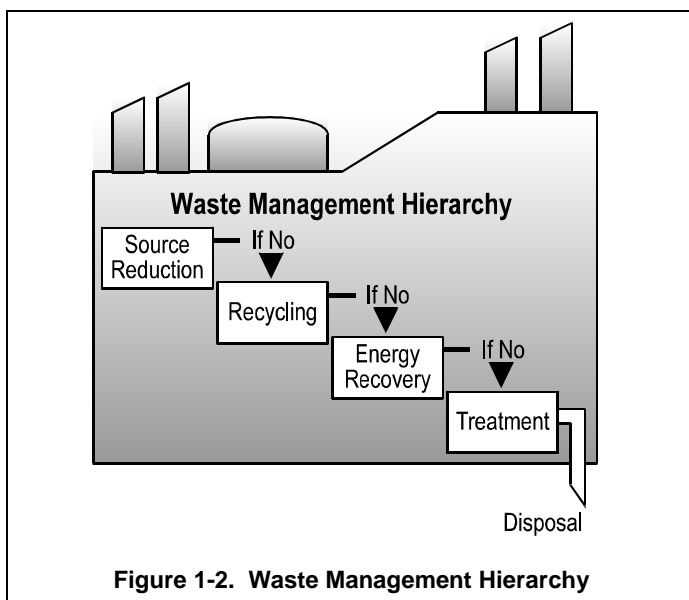
### Actual and Projected Quantities of TRI Chemicals in Waste, 1991-1998

Source reduction was nationally established by the Pollution Prevention Act (PPA) of 1990 as the preferred approach to managing toxic chemicals in waste. Source reduction means preventing waste from being generated. TRI also collects information on source reduction activities at the facility during the year; these are activities undertaken to reduce the amount of toxic chemicals that enter a waste stream or are otherwise released to the environment. The PPA also established a hierarchy of waste management options as national policy for situations where source reduction is not feasible (see Figure 1-2).

Table 1-7. Change in Total On-site and Off-site Releases, by Industry, 1988 and 1994-1996

SIC Code	Industry	Total On- and Off-site Releases				Change 1988-1996	
		1988 Pounds	1994 Pounds	1995 Pounds	1996 Pounds	Pounds	Percent
20	Food	8,377,717	6,013,560	5,120,357	5,120,503	-3,257,214	-38.9
21	Tobacco	341,927	134,771	95,226	73,415	-268,512	-78.5
22	Textiles	35,798,377	16,346,332	15,655,607	15,280,411	-20,517,966	-57.3
23	Apparel	1,025,697	1,380,947	1,259,986	1,741,831	716,134	69.8
24	Lumber	32,981,807	32,986,266	30,434,637	27,116,641	-5,865,166	-17.8
25	Furniture	62,363,120	52,134,945	41,530,300	35,651,541	-26,711,579	-42.8
26	Paper	207,603,004	185,334,196	178,774,984	172,799,131	-34,803,873	-16.8
27	Printing	61,187,518	34,386,679	30,895,852	28,269,786	-32,917,732	-53.8
28	Chemicals	1,047,782,223	537,482,685	539,600,255	513,043,111	-534,739,112	-51.0
29	Petroleum	72,780,821	46,877,100	42,593,318	43,076,652	-29,704,169	-40.8
30	Plastics	158,313,799	125,462,108	114,765,358	105,358,191	-52,955,608	-33.4
31	Leather	13,023,617	5,104,391	4,026,421	3,813,502	-9,210,115	-70.7
32	Stone/Clay/Glass	40,539,364	17,359,182	19,053,390	23,263,716	-17,275,648	-42.6
33	Primary Metals	629,353,951	433,885,649	455,029,353	496,662,641	-132,691,310	-21.1
34	Fabricated Metals	160,369,759	99,572,056	90,440,941	77,610,533	-82,759,226	-51.6
35	Machinery	69,747,296	27,120,215	22,851,633	19,162,054	-50,585,242	-72.5
36	Electrical Equip.	132,719,036	36,671,754	31,457,129	33,753,037	-98,965,999	-74.6
37	Transportation Equip.	208,391,846	128,139,353	114,746,256	105,231,558	-103,160,288	-49.5
38	Measure./Photo.	58,084,824	14,328,227	12,955,213	10,358,619	-47,726,205	-82.2
39	Miscellaneous	32,592,710	15,350,168	13,285,855	9,843,403	-22,749,307	-69.8
Multiple Codes 20-39		308,351,079	149,011,079	122,436,826	91,157,789	-217,193,290	-70.4
No Codes 20-39		11,229,042	17,704,243	8,281,275	5,376,979	-5,852,063	-52.1
Total		3,352,958,534	1,982,785,906	1,895,290,172	1,823,765,044	-1,529,193,490	-45.6
Federal Facilities		NA	7,920,210	5,907,355	4,091,563	NA	NA

**Note:** Does not include delisted chemicals, chemicals added in 1990, 1991, 1994, and 1995, aluminum oxide, ammonia, hydrochloric acid, and sulfuric acid. **On-site Releases** from Section 5 of Form R and **Off-site Releases** from Section 6 (transfers off-site to disposal) of Form R. Forms that reported more than one 2-digit SIC code within the range of 20 to 39 are assigned to the "multiple" category. Forms with no 2-digit SIC code within the range of 20 to 39 are assigned to the "no codes 20-39" category. **NA:** Federal facilities not required to report before 1994.



Box 1-10 provides a breakdown of the waste management information added to TRI with passage of the PPA. This includes recycling, energy recovery, and treatment both at the facility and elsewhere. It also includes the quantity released on- and off-site. Tables in the TRI data release identify the sum of these quantities as total production-related waste. Facilities report actual waste management quantities for the current and prior years and project expected quantities for the next two years.

Table 1-8 presents total production-related waste by industry for 1996 and the change in total production-related waste the industries projected through 1998. Production-related waste, which totaled 23.42 billion pounds in 1996, was projected to increase by 3.2% to 24.17 billion pounds in 1998.



**Box 1-10. An Explanation of Waste Management Information**

**An Explanation of Waste Management Information**

Information about facilities management of TRI chemicals in waste is reported in Section 8 of Form R.

**Recycled On-site.** This is the quantity of the toxic chemical recovered at the facility and made available for further use. It is not the quantity that entered an on-site recycling or recovery operation.

**Recycled Off-site.** This is the quantity of the toxic chemical that left the facility boundary for recycling, not the amount recovered at the off-site location. This quantity includes the amount(s) reported in Section 6 of Form R as transferred off-site for recycling, less any amount(s) associated with non-routine events.

**Used for Energy Recovery On-site.** This is the quantity of the toxic chemical that was combusted in some form of energy recovery device, such as a furnace (including kilns) or boiler. The toxic chemical should have a heating value high enough to sustain combustion. To avoid double-counting, the amount reported represents the amount destroyed in the combustion process, not the amount that entered the energy recovery unit. For example, 100,000 pounds of toluene entered a boiler that, on average, combusted 98% of the toluene. Any remaining toluene was discharged to air. A total of 98,000 pounds is reported as combusted for energy recovery (the remaining 2,000 pounds is reported as released).

**Used for Energy Recovery Off-site.** This is the quantity of the toxic chemical that left the facility boundary for energy recovery, not the amount combusted at the off-site location. The toxic chemical must have a significant heating value, and the off-site location must have some form of energy recovery unit in place. This quantity includes the amount(s) reported in Section 6 of Form R as transferred off-site for energy recovery, less any amount(s) associated with non-routine events.

**Treated On-site.** This is the quantity of the toxic chemical destroyed in on-site waste treatment operations, not the amount that entered any treatment operation. For example, if 100,000 pounds of benzene were combusted in an incinerator that destroyed 99% of the benzene, the facility would report 99,000 pounds as treated on-site (the remaining 1,000 pounds would be reported as released).

**Treated Off-site.** This is the quantity of the toxic chemical that left the facility boundary and was sent to POTWs or other off-site locations for treatment, not the amount that was destroyed at the off-site location(s). This quantity includes the amount(s) reported in Section 6 of Form R as transferred to POTWs or other off-site locations for treatment, less any amount(s) associated with non-routine events.

**Released On- and Off-site.** This is the total quantity of the toxic chemical that was released to the environment or disposed of at the facility (directly discharged to air, land, and water, and injected underground) or sent off-site for disposal. This quantity is the sum of the amounts reported in Sections 5 and 6 of Form R (releases plus transfers to disposal only) less any amount(s) associated with non-routine events.

**Released to the Environment Due to One-time Events.** This amount is referred to as non-production-related waste and is the quantity released to the environment or sent off-site for recycling, energy recovery, treatment, or disposal due to one-time events not associated with routine production practices. Such events include catastrophic events, such as accidental releases, as well as remedial actions (clean up). This quantity is separated from the quantities recycled, used for energy recovery, treated, and released, to distinguish between quantities that are routinely associated with production operations and are more amenable to source reduction and those that are not routinely associated with production processes and are not so amenable to source reduction because they are not readily anticipated. This separation is important in assessing progress in source reduction at facilities.

**Table 1-8. Actual and Projected Total Production-related Waste, by Industry, 1996-1998**

SIC Code	Industry	Total Production-related Waste				
		Current Year 1996 Pounds	Projected		Change	
			1997 Pounds	1998 Pounds	1996-1997 Percent	1996-1998 Percent
20	Food	397,557,868	653,060,717	727,957,465	64.3	83.1
21	Tobacco	5,921,753	6,058,749	6,208,774	2.3	4.8
22	Textiles	64,609,067	63,000,446	59,903,878	-2.5	-7.3
23	Apparel	3,273,589	2,670,153	2,341,081	-18.4	-28.5
24	Lumber	110,972,285	112,364,213	105,247,446	1.3	-5.2
25	Furniture	57,823,940	55,286,126	55,415,684	-4.4	-4.2
26	Paper	1,599,797,509	1,607,516,198	1,592,387,416	0.5	-0.5
27	Printing	266,207,152	271,986,787	273,386,005	2.2	2.7
28	Chemicals	10,032,390,027	10,353,025,860	10,711,018,548	3.2	6.8
29	Petroleum	2,155,301,359	2,149,256,710	2,154,256,626	-0.3	-0.0
30	Plastics	369,790,262	317,102,112	279,769,639	-14.2	-24.3
31	Leather	10,168,880	9,620,096	9,379,954	-5.4	-7.8
32	Stone/Clay/Glass	668,768,984	655,757,904	661,882,280	-1.9	-1.0
33	Primary Metals	4,184,091,672	4,157,446,855	4,098,770,311	-0.6	-2.0
34	Fabricated Metals	716,239,652	686,697,161	685,478,273	-4.1	-4.3
35	Machinery	169,485,752	154,171,333	139,198,996	-9.0	-17.9
36	Electrical Equip.	679,402,239	688,507,504	709,503,469	1.3	4.4
37	Transportation Equip.	355,169,310	349,768,654	352,591,138	-1.5	-0.7
38	Measure./Photo.	76,477,512	75,297,949	75,531,810	-1.5	-1.2
39	Miscellaneous	57,640,501	57,076,721	57,369,703	-1.0	-0.5
	Multiple codes 20-39	1,344,788,998	2,035,461,325	1,328,724,148	51.4	-1.2
	No codes 20-39	90,462,402	83,350,294	86,893,334	-7.9	-3.9
	Total	23,416,340,713	24,544,483,867	24,173,215,978	4.8	3.2
	Federal Facilities	47,591,818	43,616,949	155,744,502	-8.4	227.3

**Note:** Data from Section 8 (Total of 8.1 through 8.7) of Form R for 1996. Prior year is Column A, current year is Column B, 1997 is Column C and 1998 is Column D. Forms that reported more than one 2-digit SIC code within the range of 20 to 39 are assigned to the "multiple" category. Forms with no 2-digit SIC code within the range of 20 to 39 are assigned to the "no codes 20-39" category.

Table 1-9 summarizes total production-related waste data by industry for 1991, the first year such data were collected, and for the three most recent years (1994-1996). Over that period, production-related waste rose from 18.65 billion pounds in 1991 to 19.01 billion pounds in 1996, a net increase of 1.9%.

### **Economic Overview, Multi-Year Comparisons**

1996 was the sixth year in a relatively long period of moderate expansion in the United States economy. The economy as a whole grew at a rate of 2.8% for the year, as measured by real gross domestic product (*Economic Report of the President*, February 1998). Manufacturing output grew at a rate of 1.0% for the year, somewhat slower than in the previous several years.

Table 1-10 presents production indexes for each industrial sector from 1989 to 1996. These indexes measure real output (unlike the value of shipments data). As shown in the table, production increased 17.6% from 1989 to 1996 for U.S. manufacturing overall. Table 1-11 compares the change in manufacturing production since 1989 with the change in TRI on- and off-site releases and transfers off-site for treatment. As shown in Table 1-11, reported amounts of these TRI releases and transfers have steadily decreased since 1989, even as manufacturing production recovered from small decreases in the early years of the period and expanded through 1996. Overall, while manufacturing production increased 17.6% from 1989 to 1996, TRI on- and off-site releases and transfers off-site for treatment decreased 39.0%.



## Chapter 1 — Toxics Release Inventory Data by Industry

**Table 1-9. Total Production-related Waste, by Industry, 1991 and 1994-1996**

SIC Code	Industry	Total Production-related Waste				Change	
		1991	1994	1995	1996	1995-1996	1991-1996
		Pounds	Pounds	Pounds	Pounds	Percent	Percent
20	Food	63,066,268	72,118,666	71,156,494	70,151,157	-1.4	11.2
21	Tobacco	51,405,093	238,686	150,596	107,615	-28.5	-99.8
22	Textiles	51,580,594	49,696,040	46,439,252	46,960,548	1.1	-9.0
23	Apparel	2,340,880	2,450,405	2,081,936	2,983,859	43.3	27.5
24	Lumber	68,482,868	62,445,982	117,713,741	108,000,702	-8.3	57.7
25	Furniture	62,158,973	69,100,903	64,657,002	57,110,926	-11.7	-8.1
26	Paper	1,401,164,200	1,390,873,031	1,317,034,610	1,305,706,645	-0.9	-6.8
27	Printing	259,904,658	238,262,543	291,227,127	265,137,838	-9.0	2.0
28	Chemicals	7,588,654,698	7,960,775,406	7,945,305,210	7,944,446,007	-0.0	4.7
29	Petroleum	1,171,406,294	1,272,138,197	1,006,857,742	1,812,421,303	80.0	54.7
30	Plastics	457,662,674	511,959,880	498,365,536	338,869,255	-32.0	-26.0
31	Leather	18,010,356	8,750,968	7,542,055	6,287,054	-16.6	-65.1
32	Stone/Clay/Glass	945,494,178	1,003,550,335	835,143,656	642,733,737	-23.0	-32.0
33	Primary Metals	2,306,289,254	3,125,155,465	3,201,648,708	3,247,781,282	1.4	40.8
34	Fabricated Metals	639,270,669	802,980,329	676,733,941	676,808,105	0.0	5.9
35	Machinery	220,732,830	168,142,108	154,403,423	159,614,838	3.4	-27.7
36	Electrical Equip.	663,918,802	547,072,102	592,043,373	612,154,741	3.4	-7.8
37	Transportation Equip.	382,686,549	413,901,849	377,430,033	334,876,290	-11.3	-12.5
38	Measure./Photo.	114,962,999	73,269,084	73,757,533	67,302,183	-8.8	-41.5
39	Miscellaneous	59,754,379	62,368,995	55,563,414	55,967,458	0.7	-6.3
Multiple Codes 20-39		1,948,479,575	1,243,934,543	1,344,098,604	1,175,283,275	-12.6	-39.7
No Codes 20-39		167,790,586	216,475,822	89,307,448	78,091,387	-12.6	-53.5
Total		18,645,217,377	19,295,661,339	18,768,661,434	19,008,796,205	1.3	1.9
Federal Facilities		NA	36,195,048	77,626,788	46,040,436	-40.7	NA

**Note:** Does not include delisted chemicals, chemicals added in 1994 and 1995, and ammonia, hydrochloric acid, and sulfuric acid. Data from Section 8 (Total of 8.1 through 8.7, Column B) of Form R of year indicated. Forms that reported more than one 2-digit SIC code within the range of 20 to 39 are assigned to the "multiple" category. Forms with no 2-digit SIC code within the range of 20 to 39 are assigned to the "no codes 20-39" category. **NA:** Federal facilities not required to report before 1994

**Table 1-10. Industrial Production Indexes by Industry, 1989-1996**

SIC Code	Industry	1989	1990	1991	1992	1993	1994	1995	1996
Total Index		100.0	99.9	97.9	101.0	104.4	109.7	113.2	116.4
Manufacturing		100.0	99.5	97.2	101.0	104.7	110.5	114.3	117.6
20	Food	100.0	101.1	102.6	104.3	106.5	108.1	110.2	110.9
21	Tobacco	100.0	100.0	93.8	94.9	79.7	98.4	100.8	100.2
22	Textiles	100.0	96.6	96.1	103.6	109.3	114.8	113.9	110.6
24	Lumber	100.0	97.4	90.6	95.9	96.7	101.5	101.8	105.3
25	Furniture	100.0	98.5	92.6	97.7	102.2	105.4	106.1	106.3
26	Paper	100.0	100.6	101.5	104.8	109.0	113.6	115.2	113.2
27	Printing	100.0	99.6	95.7	96.6	97.4	97.1	96.4	95.2
28	Chemicals	100.0	102.3	101.4	105.2	106.2	109.5	112.0	114.4
29	Petroleum	100.0	101.0	99.8	100.7	103.6	103.7	105.2	107.3
30	Plastics	100.0	101.1	99.5	109.6	117.1	127.3	130.4	132.2
31	Leather	100.0	96.3	87.9	89.4	90.3	83.6	76.6	71.5
32	Stone/Clay/Glass	100.0	97.8	90.5	93.1	95.1	100.5	101.6	103.4
33	Primary Metals	100.0	99.1	92.2	95.3	100.6	107.7	110.3	111.6
34	Fabricated Metals	100.0	96.6	91.8	95.4	99.6	106.9	110.4	113.2
35	Machinery	100.0	97.2	92.6	97.1	106.7	121.7	137.3	151.8
36	Electrical Equip.	100.0	102.2	104.4	116.6	128.2	147.2	172.7	190.3
37	Transportation Equip.	100.0	97.3	91.8	95.1	98.7	102.2	99.9	101.0
38	Measure./Photo.	100.0	100.2	101.6	101.8	102.4	101.7	102.2	104.7

**Note:** 1989=100. Beginning 1990, data for production indexes based on 1987 Standard Industrial Classification (SIC), earlier years based on 1997 SIC. Data not provided for apparel industry (SIC coded 23).

From: 1997 *Statistical Abstract of the United States*. No. 1227. *Industrial Production Indexes, by Industry: 1980 to 1996* (Source: Board of Governors of the Federal Reserve System), *Federal Reserve Bulletin Monthly*, and *Industrial Production and Capacity Utilization, Statistical Release G. 17, monthly*).



**Table 1-11. Cumulative Change in Manufacturing Production and in TRI Releases and Transfers Off-site to Treatment and Disposal, 1989-1996**

	1989-1990	1989-1991	1989-1992	1989-1993	1989-1994	1989-1995	1989-1996
Manufacturing Production	-0.5	-2.8	1.0	4.7	10.5	14.3	17.6
TRI Releases and Transfers Off-site to Treatment and Disposal	-5.7	-19.7	-23.9	-30.1	-34.8	-37.0	-39.0

**Note:** Does not include delisted chemicals, chemicals added in 1990, 1991, 1994, and 1995, aluminum oxide, ammonia, hydrochloric acid, and sulfuric acid. Cumulative change in manufacturing production based on 1997 *Statistical Abstract of the United States*. No. 1227. *Industrial Production Indexes, by Industry: 1980 to 1996* (Source: Board of Governors of the Federal Reserve System, *Federal Reserve Bulletin Monthly* and *Industrial Production and Capacity Utilization, Statistical Release G. 17, monthly*). **TRI Releases** from Section 5 and **Transfers Off-site to Treatment and Disposal** from Section 6 of TRI Form R (excludes transfers to recycling and energy recovery reported 1991 through 1996).



## ***Chapter 1 — Toxics Release Inventory Data by Industry***